

R E M A R K S

Claims 131-151 are pending in the case. Claims 131, 133, 135, and 142 have been amended. The phrase "at least about" in Claims 133, 135, and 142, has been changed to read "about [numerical unit] or more". In Claim 131, the phrase "the bromine of (i) being the only source of bromine used in the process" has been deleted; in Claim 135, the phrase "the bromine continuously fed into the apparatus in A) being the only source of bromine used in the process" has been deleted; in Claim 142, the phrase "the bromine stream continuously fed into the mixing apparatus in A) being the only source of bromine used in the process" has been deleted. Claim 131 now recites "feed components consisting of", and Claims 135 and 142 now recite "components consisting of". The amendments to Claims 135 and 142 regarding "maintaining the pH of said product in the range of from about 12 to about 14" are supported in the Specification at least at Page 5, lines 10-13.

The Examiner is thanked for the observation that Claims 135 and 142 are still directed to processes that "comprise", and for the reminder that the term "containing" is open-ended, similar to "comprising" (M.P.E.P. §2111.03). Claims 135 and 142 have been amended to recite processes that "consist essentially of". Claim 131 has been amended to remove the word "containing", and the aqueous solution has been defined as formed from components "consisting of". The remaining amendments to Claim 131 are so that it reads more clearly; support for some of these amendments is found in the Specification at Page 5, lines 10-13..

Applicants express appreciation for Examiner Pryor's efforts to progress prosecution, as shown by the comments provided in the Advisory Action of December 7, 2009, his suggestion to have a telephonic interview, and the Response to Arguments section of the present Office Action.

Telephonic Interview

We wish to express our sincere appreciation to Dr. Johann Richter and Mr. Alton N. Pryor for making the time available for the telephonic interview with Applicant Dr. Christopher J. Nalepa (of Albemarle Corporation, assignee of this application), John F. Sieberth, and the undersigned (registered patent attorneys representing Albemarle Corporation) on March 30, 2011. During the interview, both procedural and substantive (chemistry) issues involved in the prosecution of the above application and of another

application of which Albemarle is the assignee (Appln. No. 09/785,890) were discussed. It is understood from the discussion that the Office will prepare an Interview Summary, and that the matters discussed relative to the applications will be further considered by the Examiners. Relevant points from the telephonic interview are discussed below as appropriate.

Rejections under §112

The rejection of Claims 133 and 135-151 under 35 U.S.C. §112, second paragraph, regarding the phrase "at least about" in Claims 133, line 2, Claim 135, line 4, and Claim 142, lines 4-5, no longer applies. The phrase "at least about [numerical unit]", which has been objected to, has been changed to read "about [numerical unit] or more". These two phrases have the same meaning, and it is understood from the telephonic interview that this change is acceptable.

Claims 131-151 have been rejected under 35 U.S.C. §112, first paragraph, for the phrase "the bromine of (i) being the only source of bromine used in the process". This phrase has been removed from Claims 131, 135, and 142, and these claims now recite "feed components consisting of" (Claim 131), and "components consisting of" (Claims 135 and 142).

The Board decision

This application has undergone two Interferences, Nos. 105,222 and 105,223. At the end of one of these Interferences, a decision was rendered by the Board of Patent Appeals and Interferences (the Board) in Paper No. 63 (Interference 105,223). Applicants note that Interferences are necessarily conducted by the Board, per 37 C.F.R. §41.103. In other words, the case was not under the Board's jurisdiction via an Appeal from a rejection of the claims by the Examiner.

We turn now to the substance of Paper No. 63, captioned Decision – Rehearing. In this paper, the Board directed that the Examiner reject the claims in the application over Goodenough for obviousness. The Board noted that

[T]he examiner must enter and maintain the recommended rejection unless an amendment or showing of facts not previously of record is filed which, in the opinion of the examiner, overcomes the recommended rejection. (Paper No. 63, Page 5, lines 8-14).

First, the Examiner has followed the Board's directive, and rejected the claims as obvious over Goodenough. Further, Applicants have filed amendments to the claims, which amendments were not of record at the time of the Board's decision. Therefore, if the amendments, in the opinion of the Examiner, overcome the rejection, the rejection may be withdrawn.

Regarding claim amendments, Claim 131 is directed to processes in which the pH of the product solution is maintained in a range from about 12 to about 14 during the process. As presently amended, Claims 135 and 142 are now directed to processes in which the pH of the product solution is maintained in a range from about 12 to about 14 during the process. Claim 61 (the independent claim in the case at the time of the Board's decision) read as follows:

61. A process of producing a concentrated stabilized biocidal composition which comprises mixing bromine with an aqueous solution formed from water, sulfamic acid and alkali metal base, wherein the pH of said aqueous alkali metal sulfamate solution is such that *the pH of the resulting biocidal composition is from about 12.0 to 14.0.*

For purposes of comparison, Claim 131 as presently amended is shown below, with the amendment markings removed.

131. A process of producing a concentrated, stabilized liquid biocide formulation, which process consists of cofeeding to an aqueous solution formed from components consisting of water, sulfamic acid and alkali metal base, feed components consisting of (i) bromine and (ii) a solution of alkali metal base that *maintains, while cofeeding, the pH of said concentrated, stabilized liquid biocide formulation produced in the range of from about 12 to about 14.*

The most pertinent difference between present Claim 131 and Claim 61 is the feature of the present claims already mentioned, that the pH of the product solution is maintained in a range from about 12 to about 14 during the process, while Claim 61 required that the pH of the composition being formed be in the stated range only at the end of the claimed process. Claims 135 and 142 also have the feature that the pH of the product solution is maintained in a range from about 12 to about 14 during the process.

Another pertinent difference between Claim 61 and Claim 131 is that the process in Claim 131 consists of the recited steps. Similarly, the processes in Claims 135 and 142

consist essentially of the recited steps. Since the formulation or composition can be prepared only by the processes as claimed, other steps that do not include preparing the formulation or composition and do not materially affect the basic and novel characteristic(s) of the claimed invention can be practiced without avoiding the present claims. Non-limiting examples of such other steps include removing the product from the reactor after the process has been completed.

Applicants believe that the present claims are nonobvious over the cited references, as detailed in the section below.

Rejection under §103(a)

Claims 131-151 stand rejected under 35 U.S.C. §103(a) on Goodenough et al. (U.S. 3,588,503) in view of Dallmier et al. (U.S. 5,683,654) and the Second Declaration of McKinnie (Exhibit 1073 in Interferences 105,222 and 105,223).

Upon a careful perusal of the Board decision in Paper No. 63, Applicants have observed that the rejection in this Office Action is essentially the same as that set forth by the Board, except that the Examiner has captioned the rejection more accurately, *viz.* Goodenough et al. in view of Dallmier et al. and McKinnie. In contrast, the Board set forth the rejection as over Goodenough, mentioning both McKinnie and Dallmier et al. in the facts and reasoning for the rejection. Applicants maintain that the rejection is in error.

All of the Office Actions issued from September 17, 2009, onward (four in total) contain the same sole §103(a) rejection over Goodenough in view of Dallmier et al. and McKinnie. Thus, the arguments below are in part a summary of those previously presented.

Applicants submit that McKinnie is inapplicable to the present rejection. McKinnie compares the amounts of N-bromosulfamate and N-chlorosulfamate formed when using bromine chloride versus bromine and chlorine. The present claims are directed to the use of bromine, not bromine chloride or bromine and chlorine, to produce the biocide formulations.

The combination of Goodenough and Dallmier is improper. A reference must be considered for all that it teaches, *Beckman Instruments v. LKB Produkter AB*, 892 F.2d 1547, 1551, 13 U.S.P.Q.2d 1301, 1304 (Fed. Cir. 1989), including portions that teach away from

combination. When the teachings of both Goodenough and Dallmier are considered as a whole, rather than selecting individual portions therefrom, it is clear that the rejection is based on a pair of references which are inconsistent with each other. Indeed, a reading of Dallmier shows that Dallmier regards the Goodenough process to be hazardous because of the use of diatomic halogen as well as the formation of bromate, a suspected carcinogen, and that the way to avoid these problems is to conduct the process described by Dallmier. Thus, it is not proper to cite Dallmier for its teaching that the pH of the final solution is 12-14, while ignoring Dallmier's disclosures regarding the halogen source and the order of addition. Reconsideration and withdrawal of the rejection, which requires the combination of Goodenough and Dallmier, is respectfully requested.

The Office Action correctly quotes Dallmier as disclosing a process that "improves on the Goodenough reference by means of a safer, easier, and more economical process" (Page 4, lines 11-12; Paper No. 63, Page 7, line 23, to Page 8, line 2). We submit that this quotation actually supports the position that Dallmier improves on the Goodenough disclosure by providing a safer, easier, and more economical process, *i.e.*, a **different process** from that of Goodenough. In other words, Dallmier does not improve on the process of Goodenough. This means that Dallmier: 1) points out many deficiencies and shortcomings of the Goodenough process; 2) discards the Goodenough process; and 3) provides a different process as a replacement, which process is stated to be safer, easier, and more economical than the process taught in Goodenough.

Turning now to one facet of the processes in the cited references, Goodenough uses bromine (Br_2) as the halogen source. In sharp contrast, Dallmier et al. does not use diatomic halogen molecules. Dallmier et al. solves the problem of the handling issues and corrosive nature of diatomic halogens (such as Br_2) by avoiding their use altogether. Dallmier accomplishes this by combining an aqueous hypochlorite solution and an aqueous bromide source (column 3, lines 59-61); the bromide source is typically a bromide salt, usually an alkali metal bromide salt (column 4, lines 33-36). Clearly, Dallmier does not employ diatomic halogen molecules to form the biocides taught therein. In fact, Dallmier strongly discourages use of bromine (Br_2) as taught by Goodenough. For example, at column 2, lines 28-32, Dallmier states:

Because elemental bromine is used in the process disclosed in the Goodenough, et al. reference, this process is difficult to complete as well as

potentially hazardous since elemental bromine is a fuming, corrosive, toxic liquid.

Thus, Dallmier explicitly teaches away from combination with Goodenough, and there is no reason for one of ordinary skill in the art to combine Dallmier et al. with Goodenough et al., which employs bromine (Br₂) as the bromine source.

The present claims are process claims. Goodenough and Dallmier teach incompatible processes for forming halogen-based biocidal solutions. More specifically, Goodenough discloses that an aqueous solution of bromine is contacted with a bromine value stabilizer (e.g., sulfamic acid) and sufficient hydroxide to form a solution having a pH of 8 to 10 (column 2, lines 1-6). Goodenough further states that the order of addition is not critical (column 2, lines 10-12). Conversely, the Dallmier order of addition is critical, as pointed out in column 6, lines 33-36 and in column 7, lines 51-52. In Goodenough, the halogen is added to the solution second (Example 3, solution A) or last (Example 3, solution B); in both instances, the stabilizer (sulfamic acid) is already present in the solution. Dallmier insists that the halogen be added first and, importantly, that a period of time pass before a stabilizer (alkali metal sulfamate) is added.

Both the Office Action and the Board noted the teachings of Dallmier et al. regarding the undesired formation of bromate. In the rejection, the Office Action observed that

As taught by Dallmier the formation of bromate occurs from a reaction involving hypobromite as a reactant and stabilized hypobromite (column 3, lines 24-26; column 10, lines 1-8)" (Office Action, Page 4, lines 17-19; emphases added by the undersigned).

The Board observed that

As taught by Dallmier the formation of bromate occurs from a reaction involving hypobromate [sic] as a reactant and not stabilized hypobromite (Column 3, lines 24-26; column 10, lines 1-8)" (Paper No. 63, Page 8, lines 17-20; emphases added by the undersigned).

What Dallmier et al. actually teaches is that bromate formation occurs because of disproportionation of hypobromite in alkaline or elevated pH environments. and that the disproportionation occurs at an increased rate in alkaline environments (Dallmier, column 3, lines 24-28). In the words of Dallmier et al.:

Bromate may also be formed by the disproportionation of hypobromite. This reaction occurs at a greater rate in alkaline environments. Hence, if bleach is

added to a NaBr solution, the high pH environment could lead to the undesirable production of bromate. (Column 3, lines 24-26.)

Further explaining, Dallmier et al. states:

The reaction of NaBr with NaOCl can yield significant amounts of bromate in elevated pH environments. (Column 10, lines 3-6).

Because of this tendency for formation of bromate from hypobromite in basic solution, Dallmier et al. necessarily stabilizes the hypobromite formed before raising the pH of the solution. Thus, Dallmier leads away from the presently-claimed invention by discouraging the formation of a stabilized bromine biocide composition while at high pH values.

As already stated, the present claims need not have a step to increase the pH to about 12 to about 14 because the pH is kept in that range throughout the claimed processes. The combination of Goodenough and Dallmier does not make obvious a process in which the pH is at a high value at all times during the process. As noted above, the present Claims use the phrase "consisting of" (Claim 131) or "consisting essentially of" (Claims 135 and 142), which does not permit an additional step at the end of the process to add base to reach a pH of about 12 to about 14.

The Office Action states that an artisan would have been motivated to combine the teachings of Goodenough and Dallmier to include a step of increasing the pH of the final solution to 12-14 as indicated in Dallmier in order to minimize formation of the suspected carcinogen bromate during storage (Page 4, lines 13-17; Paper No. 63, Page 8, lines 10-15). However, that is not what is presently claimed. The present claims involve no step of increasing the pH of a final solution, but instead provide a pH of about 12 to about 14 throughout the process, a feature which would not have been obvious to one of ordinary skill in the art from the improper combination of Goodenough and Dallmier.

Goodenough observes that the stabilization of the bromine values is better when hydroxide is added to the solution last (column 2 lines 12-15, emphasis added; see also Example 3). In Example 1 of Dallmier, the only part of the disclosure addressing the addition of base, the base is added to the solution last. Hence, the only common feature of the processes of Goodenough and Dallmier is a preference or requirement for adding hydroxide (base) last. In contrast, in the presently claimed processes, enough base is present *during the processes* so that the pH is about 12 to about 14 throughout the process.

Therefore, Goodenough and Dallmier would not have made the presently claimed invention obvious.

Dallmier teaches that it is unfavorable to conduct processes for formation of the biocide solutions at high pH values. As mentioned by Dr. Christopher J. Nalepa during the telephonic interview, the chemistry described by Dallmier et al., the reaction of hypochlorite with bromide ion to form hypobromite does not occur, or at least does not occur quickly enough for practical purposes at basic pH values. This limits and discourages other points of addition for the base in such processes, because Dallmier et al. teaches that it is best to stabilize the bromine values before increasing the pH of the solution, and reinforces that the base should be added last.

In support of the rejection, the Action suggests that the mixing of magnesium hydroxide with sulfamic acid in accordance with Goodenough results in an alkaline earth metal salt of sulfamic acid which is functionally equivalent to the instant alkali metal salt (sodium) of sulfamic acid (Office Action, page 3, penultimate full sentence). However, the results achieved as between the alkaline earth metal (Mg) salt of sulfamic acid and the alkali metal salt (Na) of sulfamic acid are considerably different from each other, as shown in the Declaration of inventor Dr. Christopher J. Nalepa, originally submitted in another case (Appln. No. 09/785,890), a copy of which is submitted herewith. For the Declaration, the preparation of Solution B from Goodenough's Example 3 was repeated, both as described in Goodenough with $\text{Mg}(\text{OH})_2$, and by replacing the $\text{Mg}(\text{OH})_2$ with an equimolar amount (based on hydroxide) of NaOH. In these experiments, a final pH of 13 or greater was not attained with either hydroxide. The pH of the solution prepared with $\text{Mg}(\text{OH})_2$ was 8.75, while the solution prepared with NaOH had a pH of 11.55. Thus, Goodenough does not show solutions having a pH of about 13 or greater, regardless of whether the hydroxide is $\text{Mg}(\text{OH})_2$ or an alkali metal hydroxide (Declaration of Nalepa, paragraph 6, Table 1).

In this connection, the repeated preparation of Solution B from Goodenough's Example 3, and the analogous preparation with NaOH, as described in the Declaration of Nalepa, provided interesting results. In particular, the stability (as measured by activity in ppm Br_2) is significantly *lower* for solution made with *sodium* hydroxide. After four days, the solution prepared with NaOH retained only 69% of its original activity, while the solution prepared with $\text{Mg}(\text{OH})_2$ as in Goodenough retained 97% of its original activity (Declaration

of Nalepa, paragraph 9, Table 2). Thus, the teachings of Goodenough indicate that alkali metal bases provide solutions which are inferior for retention of activity. This indicates that the presently claimed solutions do provide unexpected results – much higher retention of activity while using an alkali metal base; see Example 3, in which the solution retained 97% of activity after 63 days.

In light of the foregoing remarks, the case is believed to be in condition for allowance. Prompt notification to this effect would be sincerely appreciated.

If any matters remain that require further consideration, the Examiner is requested to telephone the undersigned at the number given below so that such matters may be discussed, and if possible, promptly resolved.

Please continue to address all correspondence in this Application to Albemarle Corporation, at their address of record.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ROBERT M. MOORE JR., ET AL.)

APPLN. NO.: 09/785,890)

GROUP ART UNIT: 1616

CONFIRMATION NO.: 5058)

EXAMINER: ALTON N. PRYOR

FILED: FEBRUARY 16, 2001)

CONTINUOUS PROCESSES FOR
PREPARING CONCENTRATED
AQUEOUS LIQUID BIOCIDAL
COMPOSITIONS)

Customer No.: 65895)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION UNDER 37 C.F.R. §1.132

Christopher J. Nalepa, Ph.D., hereby declares as follows:

1. I am a chemist employed by Albemarle Corporation, the assignee of the above-identified application by recorded assignment.
2. In 1980, I received the degree of Ph.D. in chemistry from Rice University.
3. Since 1980, I have been continuously employed as a chemist by Albemarle Corporation and the predecessor thereof, Ethyl Corporation, at the research laboratory facilities in Baton Rouge, Louisiana.
4. I am an Applicant in the above-identified application.
5. The test work described herein was conducted by me at the Albemarle Process Development Center in Baton Rouge, Louisiana.
6. In the first part of this work, Solution B of Example 3 of Goodenough (U.S. 3,558,503) was repeated, with magnesium hydroxide as described in Goodenough, and by substituting the $Mg(OH)_2$ with an equivalent amount of NaOH.

6. The order of addition of the reagents for Solutions 1 and 2 and their respective amounts are listed in Table 1 below.
7. The relative amounts of Solution 3, prepared in accordance with the present claims, is also shown in Table 1.

TABLE 1

Reagent	Solution 1 Goodenough	Solution 2 Goodenough modified	Solution 3 present case
Water	485.30 g	478.95 g	223.20 g
Sulfamic Acid	6.05 g	6.05 g	58.00 g
Bromine	5.00 g	5.01 g	--
BrCl	--	--	56.75 g
Mg(OH) ₂	3.65 g	--	--
NaOH (50% activity)	--	10.00 g	162.08 g
Total wt. of soln.	500.00 g	500.01 g	500.03 g
Moles of OH ⁻	0.125	0.125	2.025
pH of soln.	8.75	11.55	13.47

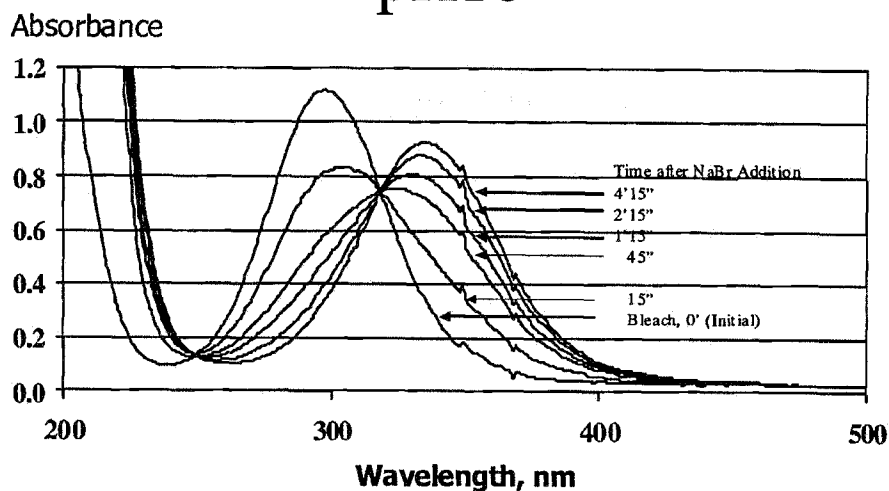
8. Solution 1 is cloudy and contains some solids.
9. The activities of Solutions 1 and 2 were measured initially and after storage for 4 days at 40°C. The initial activity and the activity after 4 days were also measured for a solution prepared in accordance with the present claims having the proportions shown above. The activities for all three of these solutions are shown in Table 2.

TABLE 2

Solution	Initial activity	Activity after 4 days	Activity retained
Solution 1 - Mg(OH) ₂	9560 ppm Br ₂	9290 ppm Br ₂	97%
Solution 2 - NaOH	9610 ppm Br ₂	6600 ppm Br ₂	69%
Solution 3 - NaOH	149,000 ppm Br ₂	150,000 ppm Br ₂	99%

10. It is my considered opinion that Goodenough does not show solutions having a pH of about 13 or greater, regardless of whether the hydroxide is $\text{Mg}(\text{OH})_2$ or an alkali metal hydroxide, based on the above results.
11. In the second part of this work, the reaction of HOCl with Br^- to form HOBr (and Cl^-) at pH 10 by UV absorption was studied. The absorption peaks for HOCl ($\lambda_{\text{max}} = 292 \text{ nm}$) and HOBr ($\lambda_{\text{max}} = 330 \text{ nm}$) were monitored.
12. HOCl and Br^- were brought together in an aqueous solution at pH 10. The HOCl was in the form of bleach; NaBr was added to the bleach solution. As seen by the UV absorbance scans taken at several time intervals, the reaction to form HOBr was complete in less than 5 minutes.
13. Figure 1 shows the UV absorbance spectra for the reaction.

Conversion of HOCl to HOBr at pH10

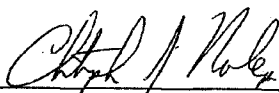


$[\text{HOCl}] = [\text{Br}^-] = 0.00284 \text{ mol/L}$; 201 ppm as Cl_2 ; 233 ppm Br^-

FIG. 1

15. It is my considered opinion that no detectable amount of HOCl is formed from HOBr and Cl^- , based on the UV absorbance results.
16. I hereby declare that all statements made herein of my own knowledge are true and that all statement made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: August 4, 2009



Christopher J. Nalepa